Release notes for ENDF/B Development n-096_Cm_240 evaluation

April 26, 2017

- `fudge-4.0` Warnings:

    1. Cross section does not match sum of linked reaction cross sections
       crossSectionSum label 0: total (Error # 0): CS Sum.

       ```
       WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.88%
       ```

    2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

    3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 2 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (2.609003e-09) is too small
       ```

    4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

    5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

    6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 4 (n + Cm240): / Form 'eval': / Component 0 (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

    7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 4 (n + Cm240): / Form 'eval': / Component 1 (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

    8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
       Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.

       ```
       WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
       ```

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9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
   Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.

   ```
   WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
   ```

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 9 (n + (Cm240_e1 ->Cm240 + gamma)): / Form 'eval': (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (4.055129e-09) is too small
    ```

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 10 (n + (Cm240_e2 ->Cm240 + gamma)): / Form 'eval': (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (2.367746e-09) is too small
    ```

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 11 (n + (Cm240_e3 ->Cm240 + gamma)): / Form 'eval': (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (8.474676e-09) is too small
    ```

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 12 (n + (Cm240_e4 ->Cm240 + gamma)): / Form 'eval': (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (6.682107e-09) is too small
    ```

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 13 (n + (Cm240_c ->Cm240 + gamma)): / Form 'eval': (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
    ```

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 14 (Cm241 + gamma): / Form 'eval': / Component 0 (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
    ```

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
    Section 14 (Cm241 + gamma): / Form 'eval': / Component 1 (Error # 0): Condition num.

    ```
    WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
    ```

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 15 (n + Cm240 [angular distribution]): / Form 'eval': (Error # 1): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

18. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 16 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

19. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 17 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

20. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 18 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

21. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 19 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

- `fudge-4.0` Errors:

  1. Duplicate Eout in outgoing distribution
  Reading ENDF file: ../n-096_Cm_240.endf (Error # 0): Bad Eout

  ```
  WARNING: skipping duplicate e_out = 6093330.0, i1 = 76 0 1e-05
  ```

  2. Energy range of data set does not match cross section range
  reaction label 5: n + (Cm240_c ->Cm240 + gamma) / Product: Cm240_c / Decay product: gamma__a / Multiplicity: (Error # 0): Domain mismatch (a)

  ```
  WARNING: Domain doesn't match the cross section domain: (140000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
  ```

  3. Energy range of data set does not match cross section range
  reaction label 5: n + (Cm240_c ->Cm240 + gamma) / Product: Cm240_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (140000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (600000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
```

4. Energy range of data set does not match cross section range
   reaction label 5: n + (Cm240_c ->Cm240 + gamma) / Product: Cm240_c / Decay product: gamma__b / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
```

5. Energy range of data set does not match cross section range
   reaction label 5: n + (Cm240_c ->Cm240 + gamma) / Product: Cm240_c / Decay product: gamma__c / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
```

6. Energy range of data set does not match cross section range
   reaction label 5: n + (Cm240_c ->Cm240 + gamma) / Product: Cm240_c / Decay product: gamma__d / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (600000.0 -> 20000000.0) vs (110926.0 -> 20000000.0)
```

7. Calculated and tabulated Q values disagree.
   reaction label 6: n[multiplicity:'2'] + Cm239 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: -7854939.084594727 eV vs -7537880. eV!
```

8. Calculated and tabulated Q values disagree.
   reaction label 7: n[multiplicity:'3'] + Cm238 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: -14130053.74874878 eV vs -1.38131e7 eV!
```

9. Calculated and tabulated Q values disagree.
   reaction label 9: Cm241 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 5776386.892150879 eV vs 6093330. eV!
```

10. Multiplicity does not match sum of linked product multiplicities!
    multiplicitySum label 7: n + (Cm240_c ->Cm240 + gamma) total gamma multiplicity (Error # 0): summedMultiplicityMismatch

```
WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 29.40%
```

11. Calculated and tabulated Q values disagree.
    fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 224549545138.1986 eV vs 2.0996e8 eV!
```

12. Calculated and tabulated Q values disagree.
    fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 224549545138.1986 eV vs 2.0996e8 eV!
```

13. Calculated and tabulated Q values disagree.
*fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2']
(Error # 0): Q mismatch*

```
WARNING: Calculated and tabulated Q-values disagree: 224549545138.1986 eV vs 2.0996e8 eV!
```

14. Calculated and tabulated Q values disagree.
*fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3']
(Error # 0): Q mismatch*

```
WARNING: Calculated and tabulated Q-values disagree: 224549545138.1986 eV vs 2.0996e8 eV!
```

15. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.
*Section 15 (n + Cm240 [angular distribution]): / Form 'eval': / LegendreLValue L=1
vs 1 (Error # 0): Bad evs*

```
WARNING: 10 negative eigenvalues! Worst case = -2.684246e-05
```

- njoy2012   Warnings:

1. Evaluation has no resonance parameters given
unresr...calculation of unresolved resonance cross sections (0): No RR

```
   ---message from unresr---mat 9625 has no resonance parameters
                      copy as is to nout
```

2. In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in
File 3, but no corresponding distributions are given. In these cases, it is assumed that
MT=18 should be used for the fission neutron distributions.
heatr...prompt kerma (0): HEATR/hinit (3)

```
   ---message from hinit---mt19 has no spectrum
                      mt18 spectrum will be used.
```

3. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (1): HEATR/hinit (4)

```
   ---message from hinit---mf6, mt 16 does not give recoil za= 96239
                      one-particle recoil approx. used.
```

4. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (2): HEATR/hinit (4)

```
   ---message from hinit---mf6, mt 17 does not give recoil za= 96238
                      one-particle recoil approx. used.
```

5. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (3): HEATR/hinit (4)

```
   ---message from hinit---mf6, mt 51 does not give recoil za= 96240
                      one-particle recoil approx. used.
```

6. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (4): HEATR/hinit (4)

```
      ---message from hinit---mf6, mt 52 does not give recoil za= 96240
                          one-particle recoil approx. used.
```

7. Recoil is not given, so one-particle recoil approximation used.
   heatr...prompt kerma (5): HEATR/hinit (4)

```
      ---message from hinit---mf6, mt 53 does not give recoil za= 96240
                          one-particle recoil approx. used.
```

8. Recoil is not given, so one-particle recoil approximation used.
   heatr...prompt kerma (6): HEATR/hinit (4)

```
      ---message from hinit---mf6, mt 54 does not give recoil za= 96240
                          one-particle recoil approx. used.
```

9. Recoil is not given, so one-particle recoil approximation used.
   heatr...prompt kerma (7): HEATR/hinit (4)

```
      ---message from hinit---mf6, mt 91 does not give recoil za= 96240
                          one-particle recoil approx. used.
```

10. Recoil is not given, so one-particle recoil approximation used.
    heatr...prompt kerma (8): HEATR/hinit (4)

```
      ---message from hinit---mf6, mt102 does not give recoil za= 96241
                          photon momentum recoil used.
```

11. There is a problem with the fission energy release.
    heatr...prompt kerma (19): HEATR/nheat (3)

```
      ---message from nheat---changed q from   2.099600E+08 to   1.985028E+08
                          for mt  18
```

12. Evaluation has no resonance parameters given
    purr...probabalistic unresolved calculation (0): No RR

```
      ---message from purr---mat 9625 has no resonance parameters
                          copy as is to nout
```

- `xsectplotter`   Errors:

  1. Duplicate Eout in outgoing distribution
     (Error # 2): Bad Eout

```
      WARNING: skipping duplicate e_out = 6093330.0, i1 = 76 0 1e-05
```

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